

WEST COAST GROUND FISH OBSERVER PROGRAM
**DATA REPORT AND SUMMARY ANALYSES OF OPEN ACCESS FIXED-
GEAR FISHERIES IN WATERS LESS THAN 50 FATHOMS**

Northwest Fisheries Science Center

May 2005

Objective

The WCGOP collects at-sea data from limited entry trawl, nearshore, prawn, and shrimp fleets. This report summarizes bycatch data collected by the West Coast Groundfish Observer Program (WCGOP) from the open access, fixed-gear fishery in shallow water from January 2003 thru August 2004. This is the first reporting of data collected from pilot coverage of this fishery. Results from the pilot program will be used to guide improvements in sampling design and coverage levels in the future. In this report, shallow water fishing is defined as any fishing activity where the average of the start and end depths is 50 fathoms or less. This report focuses on the open access nearshore fishery, but will also include any other open access fixed-gear trips that occur at less than 50 fathoms.

Introduction

West Coast Groundfish Observer Program

On May 24, 2001, NOAA Fisheries (NMFS) established the WCGOP to implement the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660). This regulation requires all vessels that catch groundfish in the Exclusive Economic Zone (EEZ) to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rulemaking has extended NMFS's ability to require that California and Oregon vessels which only fish in the 0-3 mile zone also carry observers. The observer program's goal is to improve estimates of total catch and discard. The program deploys over 40 observers,

depending on seasonal variation in fishing activity. These observers are stationed along the coast from Bellingham, WA to San Diego, CA.

Program Goals

Originally, the WCGOP focused observer effort in the limited entry trawl and fixed-gear fisheries. From July to October 2002, observers were deployed in the California and Oregon open access fisheries to determine the feasibility of obtaining coverage. Based on the findings of this initial deployment, the WCGOP determined that observing in the open access fleet was logistically impossible until a licensing/permitting structure was put in place in the states. California began licensing its nearshore fleet in 2003, and Oregon followed suit in 2004. Pilot observer coverage of the open access fishery began in 2003 for California and 2004 for Oregon. The observer coverage plan is available at: <http://www.nwfsc.noaa.gov/research/divisions/fram/Observer/>.

The West Coast Open Access Fishery

The west coast nearshore groundfish open access fleet ranges from Southern California to Northern Oregon. Prior to 2003, the fishery was not licensed by federal or state agencies. In 2003, the state of California began licensing some of their fisheries, including the nearshore fishery. Oregon licensed their nearshore fleet in 2004. The fisheries are divided into two distinct areas by target species, North of 40°10' and South of 40°10'.

The majority of fishing in shallow water North of 40°10' occurs between Port Orford, Oregon and Crescent City, California. Black and blue rockfish are the principal targets, along with cabezon and kelp greenling. These species are most commonly caught using rod and reels (fishing poles) and other line gears, though pot gears are also used.

The nearshore fishery South of 40°10' is extremely variable. The fishers target a wide variety of species, including California sheephead, cabezon, kelp greenling, and an array of nearshore rockfish species. The vast majority of recent nearshore rockfish tonnage and revenue South of 40°10' is attributable to four species: black-and-yellow, brown, gopher,

and grass rockfish. The gear is also diverse and includes rod and reel, pot, conventional longline, stick gear, and vertical longline gear.

In shallow water, fishers often fish in coves or drift along a reef. They set and haul their gear multiple times during a day and generally land their fish on a daily basis. The quotas for the open access fishery are small; generally the fishers land between 100 lb. and 1,000 lb.

Many of those who fish in shallow water participate in the live fish market, necessitating careful handling of retained fish. They sell the live fish for as much as \$8 per pound to restaurants or other vendors. Fishers also handle the discarded individuals gently, attempting to release them alive.

State Management

California

California licenses individuals for commercial fishing, including individuals who participate in the nearshore fisheries. The state issues two permits for fishing within the nearshore area: the Deep Nearshore permit and Shallow Nearshore permit. Fishers can either have a permit for just one of the fisheries (Deep or Shallow) or for both of the fisheries. The Deep Nearshore permit is required for landing black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish. The Shallow Nearshore permit is required for landing black-and-yellow rockfish, cabezon, greenlings, California scorpionfish, California sheephead, china rockfish, gopher rockfish, grass rockfish, and kelp rockfish. Most landings of live fish involve species in the Shallow Nearshore group.

In 2003, California started permitting Deep and Shallow Nearshore fisheries. The west coast groundfish fisheries are constrained by eight overfished species which leads to a complex management design. Federal management for the California open access fishery was split into two zones, South and North of 40°10' near Cape Mendocino. In addition, California designates four zones along the coastline, the south coast south of Point

Conception (34°27'), the south central coast south of Point Conception (34°27') to Point Ano Nuevo (37°07'), the north-central coast, from Point Ano Nuevo (34°27') to 40°10' near Cape Mendocino and the north coast from 40°10' to OR/CA border (42°00'). There are a number of federal (waters from 3 to 200 miles offshore) and state (waters out to 3 miles from coastline) area closures. In 2004, there were 196 California permits for Deep Nearshore species and 259 for Shallow Nearshore species.

Oregon

In 2004, for fishing in the shallow water zone (50 fathoms or less), Oregon also has Black/Blue Rockfish Permit which may or may not have an endorsement for landing other nearshore species. Oregon had 116 Black/Blue Rockfish licenses/permits with 71 nearshore endorsements. The Nearshore endorsement is required for landing cabezon, greenlings, lingcod, black rockfish, blue rockfish, calico rockfish, china rockfish, copper rockfish, quillback rockfish, brown rockfish, olive rockfish, kelp rockfish, and grass rockfish. The Black/Blue Rockfish permit allows for the landing of black and blue rockfish and a very small quota of incidental federally managed groundfish species. The federal landing limits were 5,000 lb. per two months, and no more than 1,200 lb. of species other than black or blue rockfish.

Washington

The State of Washington does not allow commercial fishing within its territorial waters, which extend 3 miles from shore. This prohibition removes nearly all fishing grounds shallower than 50 fm from access by commercial fishers.

Fish tickets and logbooks

Fisheries managers and enforcement officers use state-issued sales receipts (fish tickets) to monitor landings. This information is transferred to the Pacific Fisheries Information Network (PacFIN) by state fisheries agencies in Washington, Oregon, and California. Fish tickets are used to ensure that each vessel's landings during the primary fishery do not exceed the vessel's trip limits. Unlike the limited entry groundfish trawl fleet, vessel fishing logbooks are neither required nor routinely collected for the open access fleet.

This absence prevents an analysis comparing observed and unobserved fishing locations. Further, while limited entry trawl observers are able to record a vessel's haul-by-haul logbook estimates of retained catch, open access fixed-gear observers can only rely on their own set-by-set estimates of discarded and retained catch (see Methods).

Methods

Coverage of Trips

Pilot coverage of open access fisheries has been opportunistic. Vessels have been selected using a stratified random sample. However, the WCGOP has placed a higher priority on observing all fishing trips taken by selected limited-entry vessels than on observing open access trips. As a result, when observers have had timing conflicts between trips of limited-entry and open-access vessels, open-access trips have been missed. These priorities will be reviewed as part of the evaluation of pilot program results for open access fisheries.

WCGOP vessel selection is a stratified random selection. The WCGOP receives a combined list of Deep and Shallow Nearshore permits from California. Oregon provides two lists, one comprising Nearshore endorsements and the other black/blue rockfish permits. Each of the three lists goes through the same general process. The permits and endorsements are placed into a port group based upon the port where the majority of fish were landed the previous year. The use of port groups is designed to produce a distribution of observations along the coast that are proportional to the volume of landings. Within each port group, endorsements/permits are placed in randomly selected order and sequentially selected for observation. The endorsements/permits are selected for observation over a two-month period.

The actual coverage of trips has varied due to a variety of constraints. In some cases, open access trips have not been covered because no observer is available. Given the priorities described above, observers have only been available to cover open access trips when they are not needed for limited entry trips. Other issues that have affected the

coverage of vessels include vessel size, safety, and the ability to locate fishers. Vessels range in size from kayaks to 62 feet. Observers generally do not go on vessels less than 18 feet in length. If fishing practices and outcomes differ between small and large vessels, results will be biased towards those of larger vessels. However, larger vessels generally catch more fish, on an annual basis, which may limit the effect of any bias on summarized results. Many of the vessels used in this fishery are skiffs that are hauled out of the water and taken home after a day of fishing. This mobility can make locating and tracking a vessel difficult and may have increased the likelihood of some fishers getting coverage while others have avoided it. Also, a number of safety issues arise in the small boat fleet. Some vessels are not well maintained and some lack the capacity to safely accommodate an observer. Some fishers choose to fish in inclement weather, where vessel size and fishing proximity to shore heighten safety concerns. Observers will not travel aboard vessels that are not safe. These issues may create bias when trying to apply the observer data to the entire fleet.

Fixed-gear Data Collection

The fisheries observers are trained professionals who monitor and record catch data on commercial fishing vessels, following the protocols in the WCGOP Manual (NMFS, NWFSC, 2004, unpublished report). The data collected by the observers include:

- Start time, end time, and location of the set
- Gear type and fishing strategy
- Estimated total catch weight (including sets for which there is 100% discard)
- Weight of discard by catch category
- Reason for discard by catch category or species
- Species composition of discard by catch category
- Weight of fish retained by catch category
- Species composition of retained by catch category
- Document catch of prohibited species and incidental take of protected species
- Size composition, tags, and viability assessments for Pacific halibut
- Size composition of discarded fish (from randomly selected categories)
- Basic taxonomic composition of non-fish bycatch

- Special biological collections (otoliths, maturity, food habits, genetic samples, etc.)

Fishing Effort Data

Most vessels in the nearshore open access fleet do not have GPS. Therefore, the observers are supplied with handheld GPS units to collect fishing effort information, including latitude/longitude, start/end times, etc.

The strategy for the setting and hauling of the gear used in open access fisheries created confusion on how observers should define a set. Fishers usually fish within a cove or drift along a reef, setting the gear multiple times over a day. Observers sometimes had difficulty determining when one set ended and another began. To remedy this problem, the WCGOP designed a standard set of criteria used to define a set. When it's not possible to easily define a set as the retrieval of a distinguishable string of gear, any grouping of the same gear type that is retrieved on the same day, in the same geographic area, in the same depth range, and target the same species or species assemblage is considered the same set.

Fishing Trip Data

Fish ticket identification numbers are obtained from captains, processing plants, or PSMFC-WCGOP state liaisons and recorded. Observers interview skippers in order to assign a target strategy and gear code to each set.

Observed Total Catch

The methods used to estimate the observed total catch (OTC) of a set are: 1) summation of observed retained and discarded fish, and 2) extrapolation of partial observations. Use of method 1 is preferred. However, observers follow these general rules when deciding which method to employ:

1. If all individual fish in a set are counted, the estimated total catch weight is derived by summing the retained and discarded catch categories on the Catch Form.

2. If all of individual fish in a set are not counted, extrapolation is used. The weights of retained and discarded species in the sample from each catch categories are summed, then divided by the number of hooks sampled, and multiplied by the total number of hooks in the set.

OTC's are calculated using the number of hooks or pots set. This accounts for potential fishing mortality from lost gear, but it does assume that lost gear results in the same catch rate and mortality.

Composition Sampling

Observers sample both retained and discarded catch on fixed-gear vessels by tally sampling. Tally sampling means that the observer counts every individual fish that is caught, by species, including fish released from longlines before they are brought onboard, for all hooks or pots in a set, or a randomly selected sample thereof. Total hooks or pots in a set are determined by:

1. Counting all hooks or pots in the set,
2. Multiplying the average number of hooks per skate by the number of skates in a set. When this method is used, observers count hooks on at least 1/5 of the gear fished during each trip.

Catch Category Sampling

Catch categories are assigned based on species disposition (retained or discarded) and the method employed for determining fish weight. Three methods of determining fish weight are used on fixed-gear vessels:

1. Tally Sample – This method is used if all species are counted and an actual or extrapolated weight is obtained.
2. Visual Estimate – This method is used if a species is counted, but an actual or extrapolated weight is not obtained. It is commonly employed for large species that cannot be weighed, such as big skates. This method is also used when obtaining individual weights could increase release mortality.
3. Pacific halibut length-weight estimate – This method is used for Pacific halibut only. An estimated or actual length is taken and the Length/Weight

conversion table generated by the International Pacific Halibut Commission is used to determine weight.

If visual estimates or Pacific halibut length/weights are used, the actual number of fish in the tally sample must be documented for the catch category.

Species Composition Sampling

Species Composition samples are taken for all retained and discarded catch categories using the tally sample weight method. Actual counts, from the tally sample, are used. Weights can be actual (all individuals of species are weighed) or extrapolated from average weight.

Reasons for Discard

Observers document the reason for discard based on reason provided by the captain or crew for each catch category and/or species. The reasons for discard are categorized as ‘prohibited’, ‘size’, ‘market’, ‘regulation’, ‘other’, ‘drop-off’, and ‘predation’.

When discerning a reason for discard for a species, the primary reason for discard is used. Therefore, the categorizations of ‘drop-off’ and ‘predation’ are only used for fish that would have been retained.

Data Management

The WCGOP uses the following procedure to ensure that the quality of the data collected is maintained. Data are collected at-sea by the observer following the protocols in the WCGOP Manual (NMFS, NWFSC, 2004, unpublished report). During 2004, WCGOP used a web-based graphical user interface (GUI) that allows observers to directly enter data into a centralized Oracle database located at the Northwest Fisheries Science Center (NWFSC). Data within the Oracle database are accessible via the web-based GUI or by direct SQL queries to the database. For a list of data tables, see appendix A. For quality control of calculations and sampling methods, a debriefer or lead observer checks all computations made by the observer and reviews each form to ensure that it is complete

and that appropriate sampling methods were used. The observers are also debriefed after every two-month cumulative trip limit period. Observer debriefing includes a vessel survey, a review of observer logbooks, data correction, and observer evaluation. The database is then corrected after debriefing. For quality control, the electronic data is compared to the raw data forms, and queries are run to detect data that fall outside specified ranges and other inconsistencies between data elements. The data issues detected by the QC queries are then reviewed and the electronic data is updated. Finally, the data are considered complete and ready for analysis.

Analysis

After the quality control, the raw data are processed and analyzed. First, the subsamples of catch categories are expanded to the entire catch category at the set level. A set-level expansion is needed to estimate the total amount retained and discarded of each species in the catch because of the sampling procedure that derives the species composition. If the species composition of a catch category is mixed, an observer may take a subsample from the catch category. The following equation is used to calculate the weight of the subsample by summing across the observed weights of the individual species:

$$w_j = \sum_i x_{ij} ,$$

where

x_{ij} = observed weight of the species i in catch category j in the subsample,

w_j = weight of the subsample from catch category j .

The sampling ratio used to scale the subsample weights to the amount in the catch category is calculated by dividing the weight of the subsample by the total weight of the catch category using the equation:

$$R_j = w_j / y_j$$

where

y_j = the total weight of the catch category j .

The set-level expanded weight of the species i in the category j which is calculated by dividing the species weight in the subsample by the sampling ratio is:

$$X_{ij} = x_{ij} / R_j$$

where

X_{ij} = the weight of species i in catch categories j .

Tallying the weight (X_{ij}) of the species i across all categories j 's within a set would give the total landings of the species retained or discarded.

Prior analyses of the *limited entry* data matched the observed trips to fish ticket. However, when attempting to match the open access fixed-gear trips to fish tickets for all depths, a number of issues arose. Fifty out of 582 trips were apparently missing fish tickets, where the observer-recorded fish ticket number could not be found in PacFIN and no alternative fish ticket with a reasonable match of species and weights could be identified. There were also cases where the retained catch poundage recorded by an observer was substantially higher than the landed poundage recorded on fish tickets that were apparent matches for observed trips. Overall, the total observed retained weight for observed trips was 195,804 lb. while the fish tickets corresponding to those trips had 169,236 lb. of catch.

Additionally, observers did not always cover the entire “trip”. In this context, the completion of a “trip” is denoted by offloading and not just by a return to port. Sometimes an observer was only available for a portion of trip, referred to as a partial trip. Consequently, the observed retained catch was less than what was recorded on a fish ticket. For the 2003 to 2004 observer data, the partial trips could not be distinguished from the trips that received full coverage. Given these problems and the fact that observers measured or estimated retained catch of all open access fixed-gear trips, unlike trawl trips, the observer estimates were determined to be the most reliable measure of retained catch for purposes of generating bycatch and discard statistics. Only the observer data was used for these analyses.

The bycatch rates were calculated for pounds of species caught per 100 pounds of nearshore fish retained. The ratio estimator technique (Cochran 1977) is used to estimate bycatch rates for selected species. The fish species selected for bycatch rates are the all overfished stocks. The ratio estimates (R_{ijkl}) are calculated by area (i), depth range (j), target strategy (k), and period (l):

$$R_{ijkl} = \sum_t y_{ijklt} / \sum_t x_{ijklt}$$

where

y_{ijklt} is the pounds of a species in set t .

x_{ijklt} is the retained pounds in set t of nearshore species, which are: black rockfish, blue rockfish, brown rockfish, black and yellow rockfish, china rockfish, calico rockfish, copper rockfish, gopher rockfish, grass rockfish, kelp rockfish, Puget Sound rockfish, quillback rockfish, shortbelly rockfish, treefish, other nearshore rockfish, lingcod, cabezon, California sheephead, kelp greenling, and rock greenling.

The variance of R_{ijkl} is approximated by using the following equation (Pikitch et al. 1998):

$$Var(R_{ijkl}) = \left(\frac{\bar{y}_{ijkl}}{\bar{x}_{ijkl}} \right)^2 \left[\frac{s^2(y_{ijkl})}{\bar{y}_{ijkl}^2} + \frac{s^2(x_{ijkl})}{\bar{x}_{ijkl}^2} - \left(\frac{s^2(y_{ijkl})s^2(x_{ijkl})}{\bar{y}_{ijkl}^2 \bar{x}_{ijkl}^2} \right) \right]$$

where \bar{x}_{ijkl} , and \bar{y}_{ijkl} are the means of x_{ijklt} and y_{ijklt} over the sets and $s(x_{ijkl})$ and $s(y_{ijkl})$ are the standard errors of x_{ijklt} and y_{ijklt} . Note that $Var(R_{ijkl})$ cannot be calculated when $y_{ijklt} = 0$ or $x_{ijklt} = 0$ for all sets.

Results and Discussion

The results summarized here reflect the sets that were observed in the open access fixed-gear fishery in depths less than 50 fm. These observations were part of a pilot program that had limited coverage, which may have been unbalanced across ports or another important dimension of fishery participation, such as time. Results obtained from this pilot coverage will be used in evaluating changes to the sampling design and overall coverage levels. Caution is urged in interpreting the results summarized here as being representative of the entire nearshore fleet. Some areas or periods may have been more heavily covered than others, skewing the analysis to the areas and periods of higher coverage. Additionally, given the generally low levels of coverage of nearshore fishing, these data may not capture well the variety of fishing strategies or the variability across the range of fishing operations. Expanding these results to the entire nearshore fishery may result in biased analyses and conclusions.

Observed retained catch (in metric tons) by port group on observed open access fixed-gear sets in less than 50 fathoms is reported in Table 1. Nearly 40% of the observed retained catch was landed in the Crescent City area (including Eureka), followed by ports in the southern Oregon and the Morro Bay areas (Appendix B). Because coverage is based on observer availability, we do not expect the coverage to be representative of the amount of fish landed at each port group for all open access fixed-gear sets less than 50 fathoms.

A comparison of observed retained pounds and fish ticket landings, by species group, is provided in Table 2. Observer poundage of nearshore rockfish species represented 3% of the amount reported in fish tickets for the area south of 40°10' N. Lat., and 8% for the area north of that line. Observed poundage of cabezon and kelp greenling represented 4-5% of fish ticket poundage in the south, and 6% in the north. For California sheephead, which is not included in the Groundfish Fishery Management Plan, observed poundage was 6% of the amount reported in southern area fish tickets.

As described in the Methods section, a number of issues became apparent when attempting to match the observer data to fish tickets. As a result of these issues, caution should be used in interpreting the data reported in Table 2 as coverage estimates. The effect of missing fish tickets or under-reporting is that Table 2 may overstate the percentage of fishery removals that were observed. Ratios of observed-to-landed poundage should not be used to expand observed retained or discarded catch up to fleet-wide totals, as the effect of the negative bias of these ratios may be greatly increased with any expansion. Finally, coverage rates were not consistent across areas or time, which would create additional bias if these data are expanded.

The number of observed open access trips with sets at less than 50 fathoms is reported in Table 3 by gear type and port group. The number of observed open access sets at less than 50 fathoms is summarized in Table 4 by gear type and port group. As with observed poundage, the highest number of trips and sets occurred in the Crescent City area, followed by the Southern Oregon and Morro Bay areas. However, California port groups

south of 40°10' N. Lat. had somewhat higher percentages of observed trips and sets than observed poundage.

The number of vessels observed, by port and gear group, is reported in Table 5. Because only one vessel each from Eureka and San Francisco were observed, those observations have been pooled with trips from Crescent City and Monterey, respectively. Also, because of the small number of vessels using pot gear, particularly in the north, most of the analysis that follows combines the pot with the hook and line gear. The largest number of hook-and-line vessels was observed in the Morro Bay area (19), followed closely by the southern Oregon (18) and Crescent City areas (17). The Los Angeles and Santa Barbara areas had the most observed pot vessels: 10 and 7, respectively.

Table 6 provides a more detailed summary of the distribution of observed sets, adding the dimensions of season and depth to the area and gear stratification of Table 4. For purposes of this summary, the summer season was defined as the months from May through October, with remaining months assigned to the winter season. The vast majority of observed hook-and-line sets in both areas occurred during the summer season. However, a significant portion of the observed pot sets occurred during the winter months. This likely reflects the fact that most observed pot trips were in southern California. Nearly 90% of observed sets of pot gear in the south occurred in depths less than 10 fm. Southern line gear sets occurred primarily inside 10 fm, but roughly 35% were deeper than that. In the northern area, more than half of the line gear sets occurred in waters deeper than 10 fm. This likely reflects the reliance on black rockfish, which is distributed deeper than many other nearshore species.

Table 7 summarizes observed poundage and rates of discard for nearshore species. Discarded and retained poundage is reported for three depth intervals, as well as for all depths combined, by area and season. In the southern area, results are also stratified by gear for cabezon and California sheephead. In the south, overall discard percentages were generally in the 20-30% range for the species categories summarized. Higher rates were observed for kelp greenling and California sheephead. In the north, observed

discard of black rockfish represented less than 3% of total catch. For other species categories, generally less than 20% of the amount caught was discarded. It is important to note that these rates are for total discards, they do not represent mortality from discards. Mortality of discards will likely vary by species and the depth at which fish are caught.

Table 8 provides a similar summary of discarded and retained poundage of rebuilding species, by area, season, and depth. No cowcod, Pacific ocean perch, or darkblotched rockfish were caught in observed sets. Bocaccio rockfish were only observed in the south. Widow and yelloweye rockfish were only observed in the north. The majority of the sets discarded little or no canary rockfish, bocaccio rockfish, or yelloweye rockfish (Figures 1-3). However, larger amounts of lingcod were caught in a number of the sets. It should be noted that lingcod appear to be targeted on some of the trips. It is noted that the discard rates for canary and yelloweye rockfish follow from a prohibition on retention of these species. For reasons cited above, the poundage of these rebuilding species that was observed may not be representative of how much of each species was caught in the fishery.

Bycatch rates of rebuilding species are provided in Table 9 by area, season, and depth. No bocaccio rockfish, cowcod rockfish, Pacific ocean perch, or darkblotched rockfish were caught on observed sets with nearshore species. No widow or yelloweye rockfish were caught on observed sets with nearshore species in the South. Bocaccio rockfish did not appear in the bycatch table because they were caught in sets that didn't land nearshore species, only shelf species. Bycatch ratios increased with depth for the rebuilding species, which is expected, given their depth distributions.

Conclusion

The pilot observer coverage of open-access fisheries which began in 2003 California and 2004 in Oregon provides a valuable first look at bycatch and discarding practices in the nearshore groundfish fishery. However, given the limitations in the amount and

distribution of coverage during this pilot period, caution should be exercised in applying the results summarized in this report to the nearshore fleet as a whole. In addition to providing bycatch information for policy consideration, coverage outcomes from the pilot project will enable the WCGOP to better evaluate methods for improving sampling design and maximizing coverage levels in this segment of the groundfish fishery.

References

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NMFS, NWR (Northwest Region), NMFS-SEA-04-02, Pacific Coast Groundfish Fishery Commercial and Recreational Management Measures for March through December 2004, February 27, 2004)

Pikitch, E.K., J.R. Wallace, E.A. Babcock, D.L. Erikson, M. Saelens, and G. Oddsson. 1998. Pacific halibut bycatch in the Washington, Oregon, and California groundfish and shrimp trawl fisheries. *North American Journal of Fisheries Management*. 18:569-586.

Appendix A. Oracle Database

Database Table Hierarchy

TRIPS

► FISHING_ACTIVITIES

► FISHING_LOCATIONS

► CATCHES

► SPECIES COMPOSITION

► SPECIES_COMPOSITION_ITEMS

► BIO_SPECIMENS

► BIO_SPECIMEN_ITEMS

► DISSECTIONS

Database Table Descriptions

The database tables listed in the table below are a subset of the total tables contained in the Oracle database. They represent the tables that are actually used to contain the observer data collected by the WCGOP.

BIO_SPECIMENS	Sets of species physical measurements resulting from sampling catches occurring in a haul or set
BIO_SPECIMEN_ITEMS	Physical measurements collected for an individual fish, mammal or bird occurring in a biological sample
CATCHES	PacFIN catch category based on estimates of fish caught during a haul or set
CATCH_CATEGORIES	PacFIN catch categories
DISSECTIONS	Physical specimens collected for an individual fish, mammal or bird
FISHING_ACTIVITIES	Fishing hauls or sets occurring during a trip
FISHING_LOCATIONS	Locations of hauls or sets
PORTS	Coastal cities where fishing activity is based out of
SPECIES	Fish, mammal and bird species that might be encountered during fishing
SPECIES_COMPOSITIONS	Sets of species weights and counts resulting from sampling catches occurring in a haul or set
SPECIES_COMPOSITIONS_ITEMS	Weights and counts for individual species occurring in a species composition sample
TRIPS	Sets of fishing activities that occur between the time a vessel leaves port and when it returns
VESSELS	Trawl, longline, pot or other fishing vessels

Appendix B. Port Groups

State	Port Group	Port
OR	Astoria	Astoria / Warrenton
		Pacific City
		Garibaldi (Tillamook)
	Newport	Newport
	Coos Bay	Bandon
		Charleston (Coos Bay)
		Florence
		Winchester Bay
	Southern Oregon	Brookings
		Gold Beach
		Port Orford
CA	Crescent City	Crescent City
		Eureka
		Fields Landing
		Trinidad
	Fort Bragg	Albion
		Point Arena
		Bodega Bay
		Fort Bragg
	Monterey	Oakland
		Richmond
		San Francisco
		San Francisco Area
		Santa Cruz
		Monterey
		Moss Landing
		Princeton (Half Moon Bay)
	Morro Bay	Avila
		Morro Bay
		San Luis Obispo Area
		San Simeon
	Santa Barbara	Ventura
		Oxnard
	Los Angeles	Santa Barbara
		Dana Point Harbor
		Los Angeles Area
		Los Angeles
		Newport Beach
		Oceanside
		San Diego